

NON-PUBLIC?: N
ACCESSION #: 9405090099
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Braidwood 2 PAGE: 1 OF 5

DOCKET NUMBER: 05000457

TITLE: Reactor Trip Due to Main Power Transformer Failure
EVENT DATE: 04/05/94 LER #: 94-003-00 REPORT DATE: 05/05/94

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION: 50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: J. Achterberg, Work Planning TELEPHONE: (815) 458-2801
x2221
COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: EBF COMPONENT: TRANSF MANUFACTURER: W120
REPORTABLE NPRDS: YES

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 1539 on April 5, 1994 a Reactor Trip was received. The 2E Main Power Transformer (MPT) had a sudden pressure and a differential current trip which caused a turbine trip and a subsequent reactor trip. The cause of this reactor trip was Equipment Failure. A review of the oscillograph traces indicated a high side B phase fault on the 2E Main Power Transformer. The fault was initiated at the transformer and damage was extensive to the 2E MPT. A detailed investigation for collateral damage was performed which covered the following items: A generator crawlthru inspection; the 2W MPT and both UAT'S were electrically tested; and oil samples on the 2W MPT and both UAT'S were taken. The results of all of these activities indicated that there was no additional damage to any equipment beyond the 2E MPT. The 2E MPT will be replaced with a spare transformer. Additionally, instrumentation associated with the transformer will be calibrated prior to operation. Finally, a Company task force has been developed to investigate this recent failure. There have been previous similar occurrences where electrical system problems

have resulted in a reactor trip. The root cause(s) and corrective actions of the previous similar occurrences do not apply to this event. There is no adverse trend.

END OF ABSTRACT

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A. PLANT CONDITIONS PRIOR TO THE EVENT:

Braidwood Unit 2 Event Date: 04/05/94 Event Time: 1539 CDST
Mode 1- Power Operation; Reactor Power 99.6%
RCS Temperature/Pressure: NOT/NOP

B. DESCRIPTION OF EVENT:

At 1539 on April 5, 1994 with Unit 2 at 99.6% power operation, a Reactor Trip was received. The first out annunciator on the generator panel was "Main Transformer Sudden Pressure Generator Trip." This caused a turbine trip which resulted in a reactor trip. The 2E Main Power Transformer (MPT) had a sudden pressure and a differential current trip indication up. The differential current trip also actuated fire protection deluge as required. Also per procedure the plant fire brigade was dispatched, although no fire occurred. During the reactor scram all systems performed as expected with the exception of control rod K2 which did not insert beyond 210 steps. A separate internal root cause investigation team and NRC Augmented Inspection Team (AIT) is addressing the failure of control rod K2 to insert below 210 steps.

Offsite power continued to be supplied to the plant via the normal System Auxiliary Transformer (SAT) throughout the event.

The appropriate Emergency Notification System (ENS) notification was made at 1739 CDST pursuant to 10CFR50.72(b)(2)(ii).

This report is being submitted pursuant to 10CFR50.73(a)(2)(iv) - any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

C. CAUSE OF EVENT:

Summary of Equipment Failure Modes

The cause of this reactor trip was Equipment Failure. A review of the oscillograph traces by Commonwealth Edison Operational Analysis

Department (OAD) indicated a high side B phase fault on the 2E Main Power Transformer. The fault was initiated at the transformer and damage was extensive to the 2E MPT. Detailed inspections were performed on the 2E MPT and associated bus work and generator. Commonwealth Edison Company (CECo) Technical center transformer specialists performed a detailed internal inspection of the 2E Main Power Transformer, with significant damage found on the B phase

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winding package. Additionally, a detailed crawlthru of the main generator was performed and no indications of damage was observed. Iso phase bus duct inspections were also completed and no indications of damage were observed. All inspections to date indicate the fault damage was isolated to the 2E MPT.

In addition to visual inspections, OAD performed several other inspections and tests. A relay target analysis was performed which indicated the fault occurred on B phase. Three transformer electrical tests were performed: a low voltage excitation test, a megger, and a transformer turns ratio test all indicated a severe fault to the 2E MPT. An oil sample analysis was performed and the results indicated severe arcing occurred internal to the 2E MPT.

Additionally, weather at the time of the trip was partly sunny with temperatures at 37 degrees F. This, combined with the inspections performed of the lightning arrestors, effectively rule out lightning as being a potential cause.

Analysis of 2E MPT Prior To The Event

An analysis of the latest Commonwealth Edison System Material Analysis Department (SMAD) oil sample from the 2E MPT prior to the fault indicated that the transformer had normal combustible gas levels present. Based on this latest analysis the transformer was on an oil sampling frequency of six months. This is the normal sampling frequency and indicates the transformer is operating normally. Additionally, temperature trends prior to the transformer failure were examined, and indicated that the 2E MPT was running with normal temperatures and thus no indication of any abnormalities were present. Thermography data obtained prior to the fault on 03/25/94 indicated that temperature profiles were as expected with no signs of localized heating. All parameters for the 2E MPT indicated normal operation, and thus the unexpected fault appears to be immediate and catastrophic in nature. The decision to do additional investigation on the faulted transformer via a complete tear down will be made by the appropriate levels of company

management at a later date.

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D. SAFETY ANALYSIS:

The safety of the plant and public were not affected. The MPT sudden pressure and a differential current trip isolated the MPT from the system grid. Redundant trains of reactor protection (RP) {JG} and engineered safety features (EF) {JE} were operable, available and effective in performing their design functions.

Under the worst case condition, if the MPT fault caused a total loss of offsite power, emergency diesel generators (DG) {EK} would supply the EF electrical power requirements. This event is analyzed in section 8 of the Updated Final Safety Analysis Report.

During the event control rod K2 failed to insert beyond 210 steps. The Updated Final Safety Analysis Report Section 15 assures protection for the most reactive control rod stuck in the full out position. Control rod K2 is not the most reactive control rod and therefore this anomaly is within the bounds of our Updated Final Safety Analysis Report.

E. CORRECTIVE ACTIONS:

Immediate Actions After The Event

A detailed investigation for collateral damage was performed which covered the following items: A generator cawlt thru inspection; the 2W MPT and both UAT'S were electrically tested; and oil samples on the 2W MPT and both UAT'S were taken. The results of all of these activities indicated that there was no additional damage to any equipment beyond the 2E MPT.

Additional actions taken were as follows:

1. Isophase bus duct clean and inspection
2. Relaying and metering potential transformer test
3. Bus duct lightning arresters meggering
4. Potential transformer current limiting resistor resistance measurement
5. Generator neutral transformer megger and turns ratio test
6. Generator neutral transformer resistor resistance measurement
7. A review of 2E/W MPT oil temperatures
8. As-found calibrations of the instrumentation on the transformer was performed and the instruments were found within tolerance

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Further Actions to be completed

The 2E MPT will be replaced with a spare transformer. The spare transformer is a like-for-like replacement and will be inspected and tested prior to operation. Additionally, the temperature gages and other instruments physically located on the transformer will be calibrated prior to operation and a calibration frequency will be established. The 2E MPT relays will be calibrated prior to operation and a surveillance will be performed on the switchgear fed from the UAT's. Finally, a Company task force has been developed to investigate this recent failure.

Further actions will be evaluated based on this task force recommendations at the conclusion of their investigation.

F. PREVIOUS OCCURRENCES:

There have been previous similar occurrences where electrical system problems have resulted in a reactor trip. The root cause(s) and corrective actions of the previous similar occurrences do not apply to this event. There is no adverse trend.

LER NO: TITLE

50-456/87-052 REACTOR TRIP DUE TO MAIN POWER TRANSFORMER
OVEREXCITATION RELAY ACTUATION FOR UNKNOWN
REASON

50-456/88-012 REACTOR TRIP DUE TO PHASE B OVERCURRENT
PROTECTIVE RELAY CO-7 DEFECTIVE CURRENT SWITCH

50-456/89-002 REACTOR TRIP DUE TO A 345 KV SWITCHYARD BREAKER
DEFECTIVE TRIP COIL

50-457/92-007 REACTOR TRIP DUE TO GENERATOR TRIP AS A RESULT
OF SENSED NEUTRAL GROUND OVERCURRENT FROM FUSE
FAILURE

G. COMPONENT FAILURE DATA:

MANUFACTURER NOMENCLATURE MODEL #/MFG PART
Westinghouse 2MP01E - Main N/A
Power Transformer

Commonwealth Edison
Braidwood Nuclear Power Station
Route #1, Box 84
Braceville, Illinois 60407
Telephone 815/458-2801

May 5, 1994
BW/94-0072

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Dear Sir:

The enclosed Licensee Event Report from Braidwood Generating Station is being transmitted in accordance with the requirement of 10CFR50.73 (a)(2)(iv), which requires a 30-day written report.

This report is number 94-003-00, Docket No. 50-457.

K. L. Kofron
Station Manager
Braidwood Station

Enc: Licensee Event Report
No. 457/94-003-00

cc: NRC Region III Administrator
NRC Resident Inspector
INPO Record Center
CECo Distribution Center

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